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A gardener stores rainwater in a cylindrical container.

The container has a height of 130 centimetres.

The gardener empties the water from the container through a hose.

The hose is attached 5 centimetres from the bottom of the container.

At time t minutes after the hose is switched on, the depth of water, h centimetres, in the container decreases at a rate which is proportional to $h - 5$

Initially the container of water is full, and the depth of water is decreasing at a rate of 1.5 centimetres per minute.

20 (a)

Show that

$$\frac{dh}{dt} = -0.012(h - 5)$$

[3 marks]

20 (b)

Solve the differential equation

$$\frac{dh}{dt} = -0.012(h - 5)$$

to find an expression for h in terms of t

[5 marks]

20 (c)

Find the time taken for the container to be half empty.

Give your answer to the nearest minute.

[2 marks]